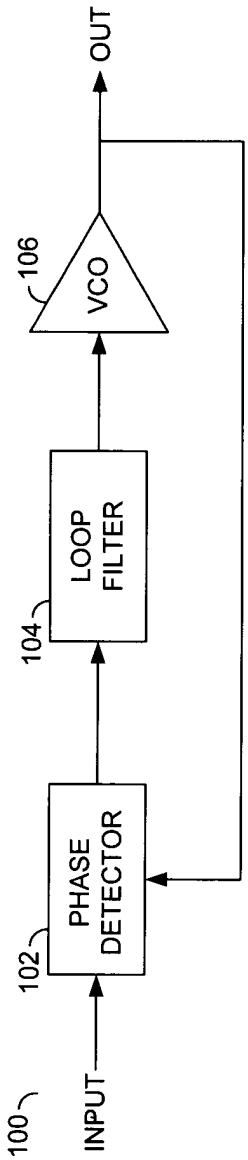
100
INPUT
102
PHASE DETECTOR
104
LOOP FILTER
106
VCO
OUT

FIG. 1

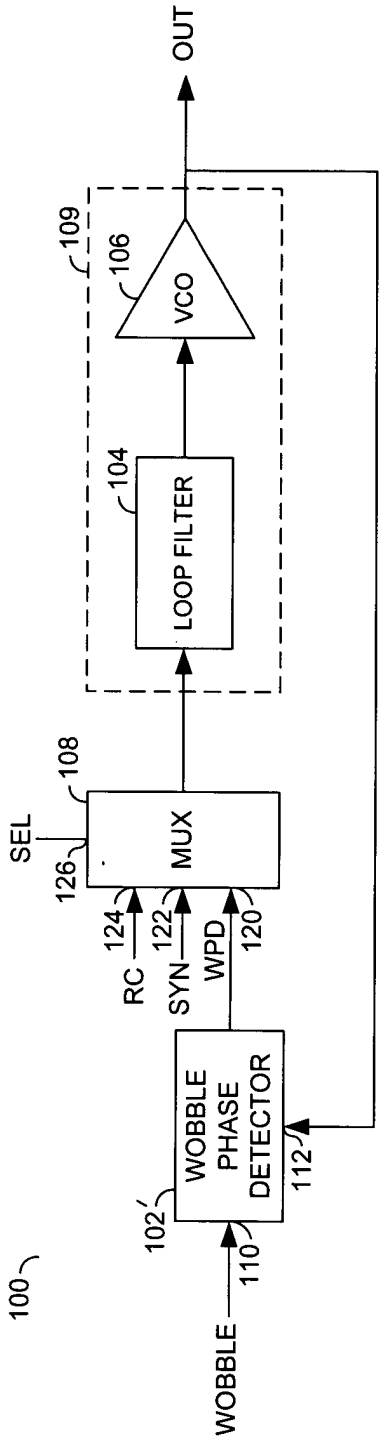
100
WOBBLE
110
102'
WOBBLE PHASE DETECTOR
112
RC
124
SYN
122
WPD
120
SEL
126
108
MUX
104
LOOP FILTER
109
106
VCO
OUT

FIG. 2

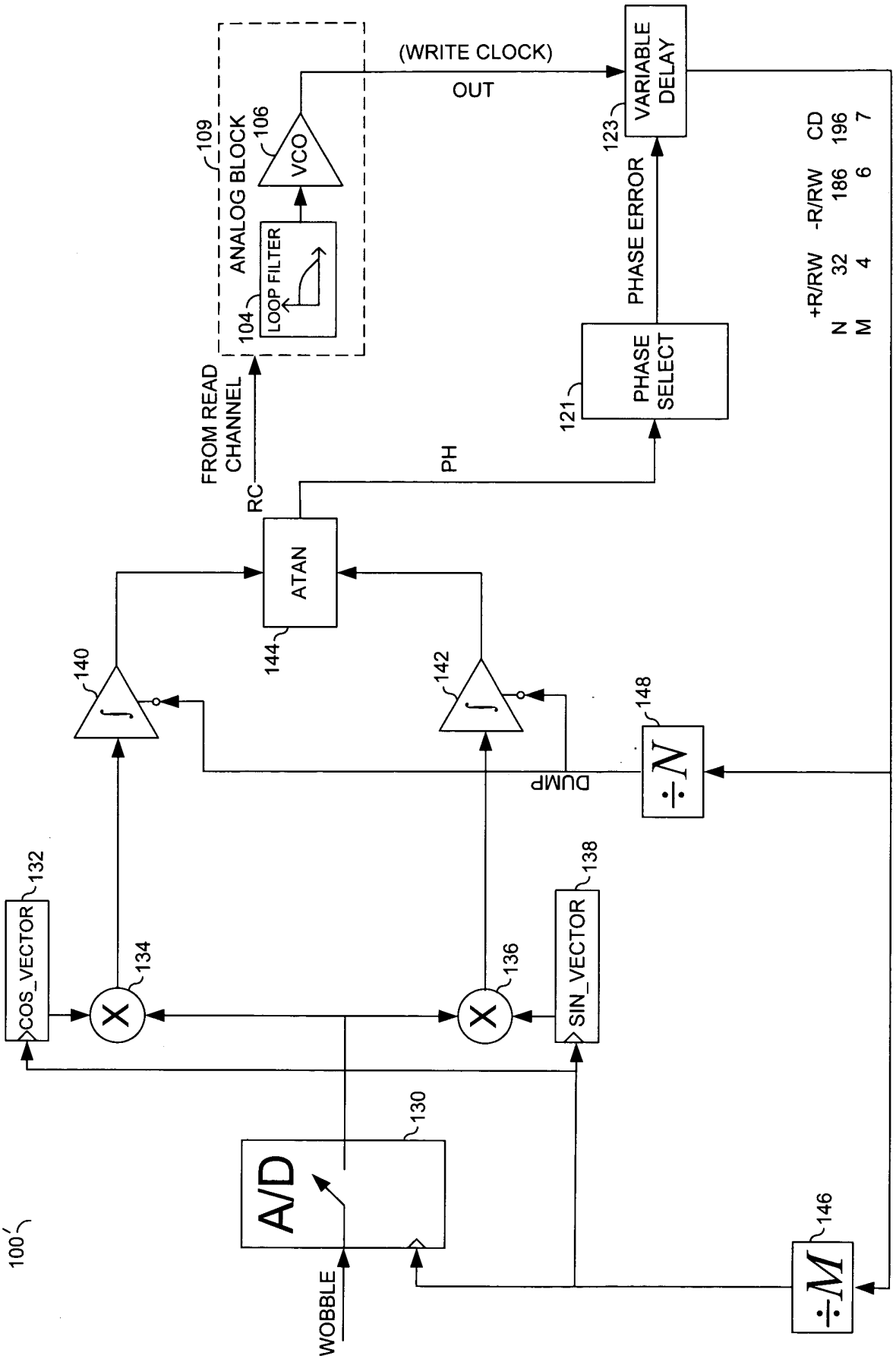
100'
WOBBLE
A/D
130
÷M
146
÷N
148
COS_VECTOR
132
SIN_VECTOR
138
134
136
140
142
ATAN
144
DUMP
FROM READ CHANNEL
RC
PH
PHASE SELECT
121
PHASE ERROR
123
VARIABLE DELAY
(WRITE CLOCK)
OUT
ANALOG BLOCK
109
VCO
106
LOOP FILTER
104
+R/RW -R/RW CD
N 32 186 196
M 4 6 7

FIG. 3

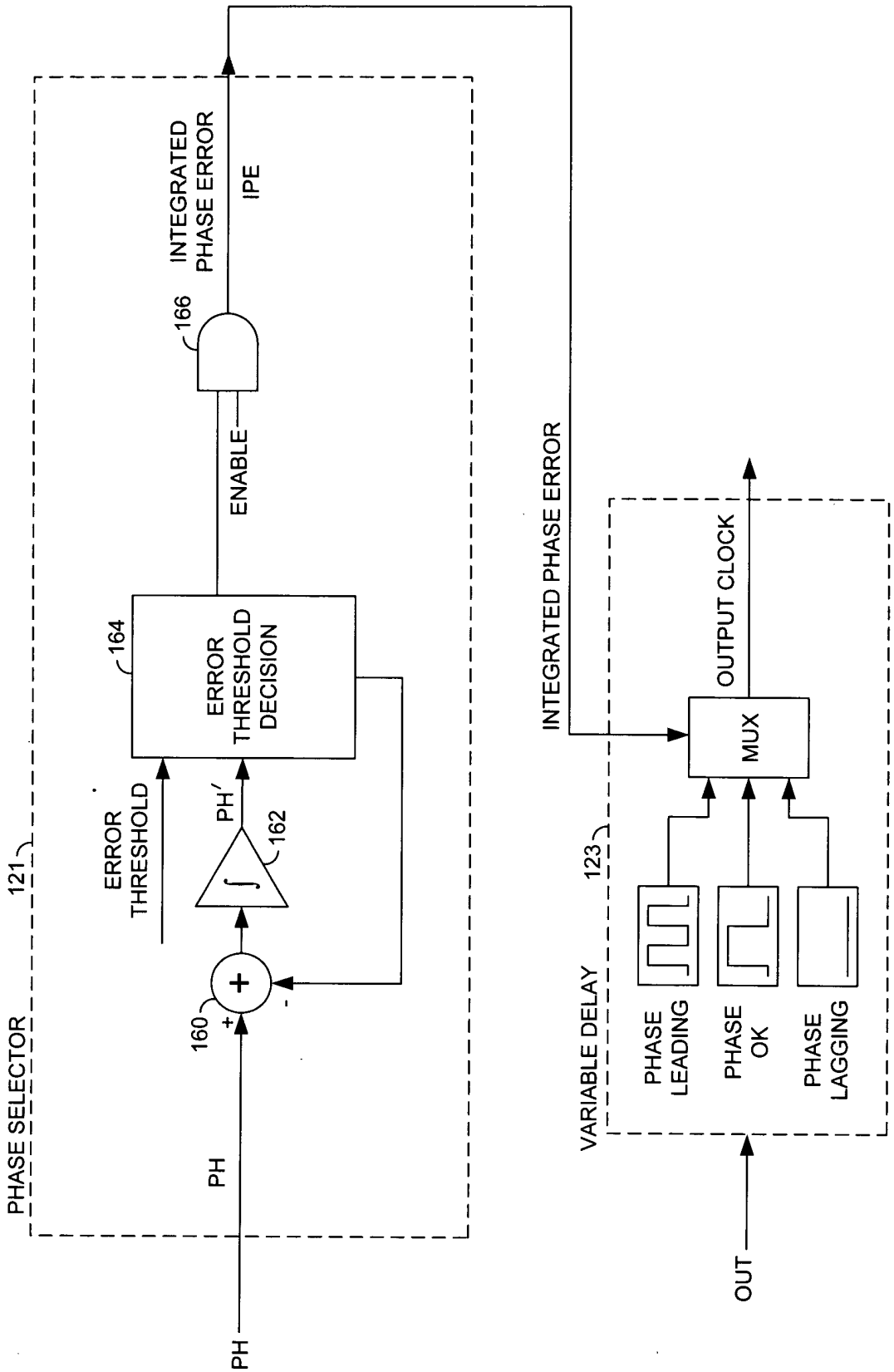
PHASE SELECTOR
121
PH
160
+
-
PH'
162
ERROR THRESHOLD
ERROR THRESHOLD DECISION
164
ENABLE
166
INTEGRATED PHASE ERROR
IPE
INTEGRATED PHASE ERROR
VARIABLE DELAY
123
PHASE LEADING
PHASE OK
PHASE LAGGING
MUX
OUTPUT CLOCK
OUT

FIG. 4

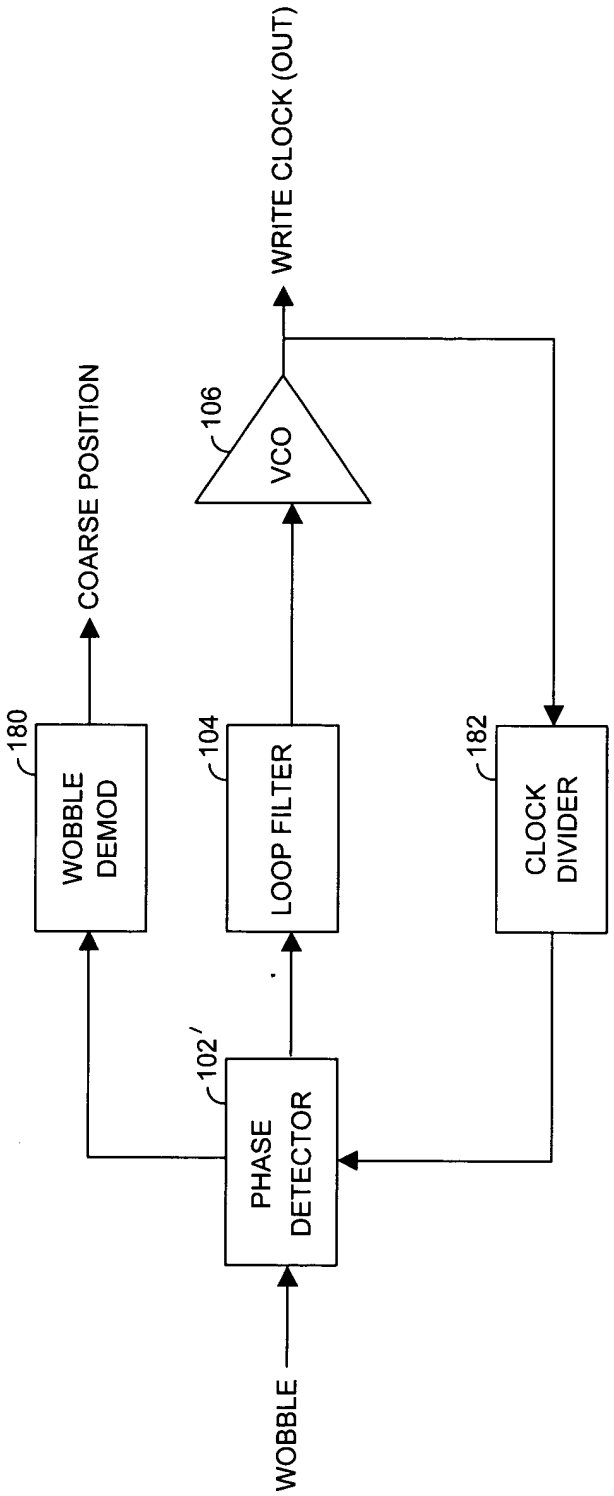
WRITE CLOCK (OUT)
106
VCO
COARSE POSITION
180
WOBBLE DEMOD
104
LOOP FILTER
182
CLOCK DIVIDER
102'
PHASE DETECTOR
WOBBLE

FIG. 5

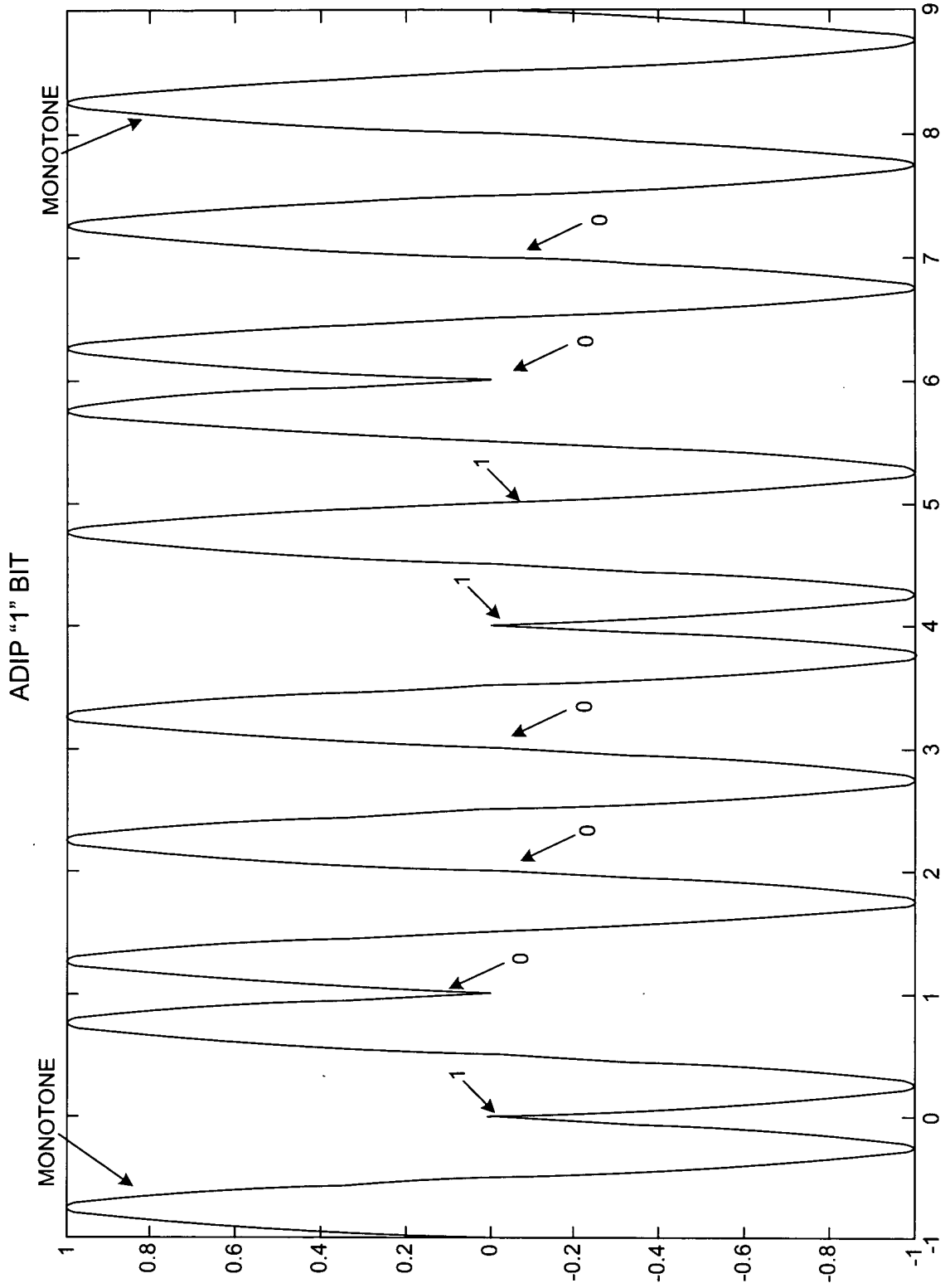
ADIP "1" BIT
MONOTONE
MONOTONE
0
0
1
1
0
0
0
1
1
0
1
2
3
4
5
6
7
8
9
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1

FIG. 6

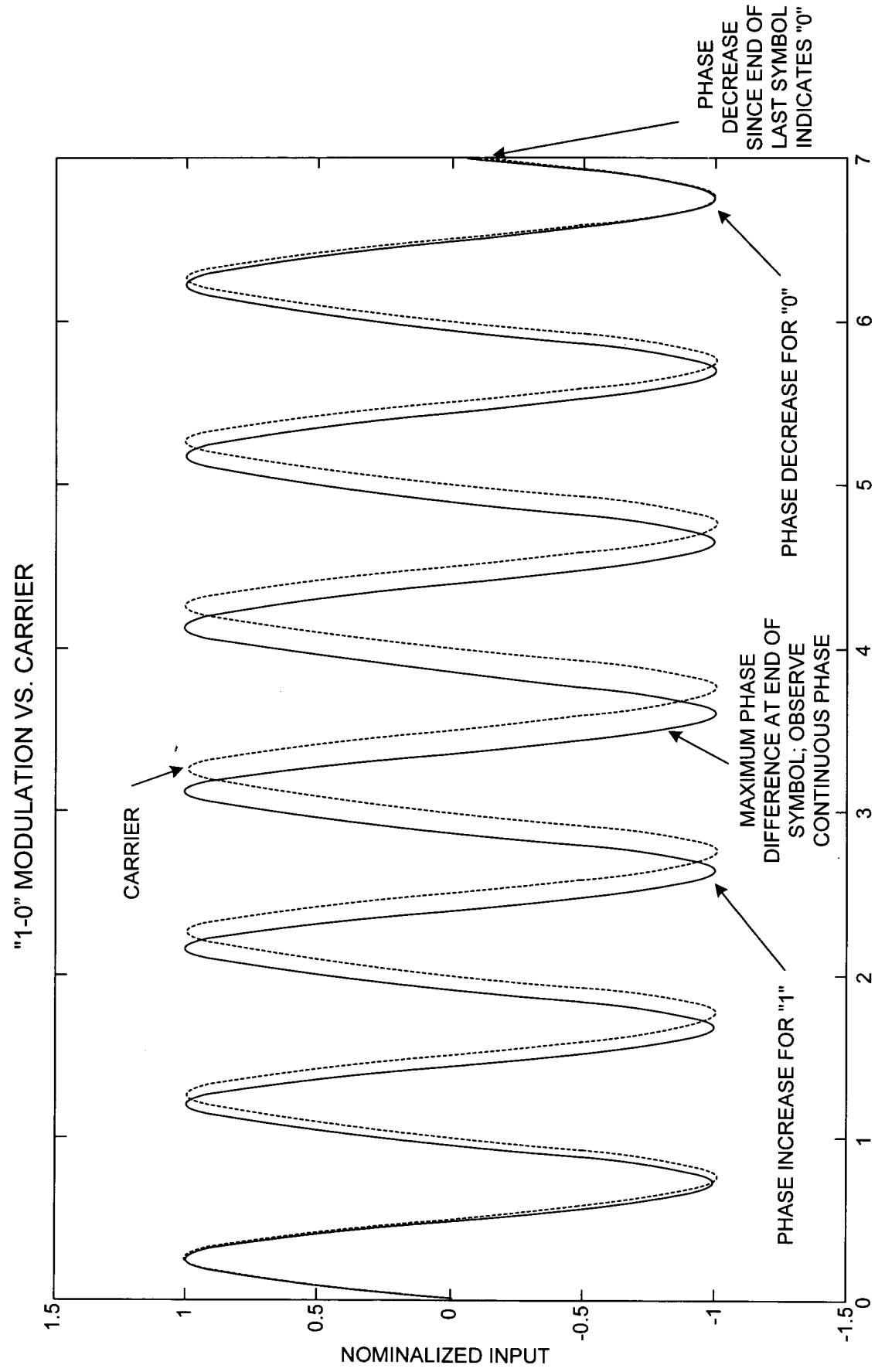
"1-0" MODULATION VS. CARRIER
NOMINALIZED INPUT
CARRIER CYCLE NUMBER
1.5
1
0.5
0
-0.5
-1
-1.5
0
1
2
3
4
5
6
7
CARRIER
PHASE INCREASE FOR "1"
MAXIMUM PHASE DIFFERENCE AT END OF SYMBOL; OBSERVE CONTINUOUS PHASE
PHASE DECREASE FOR "0"
PHASE DECREASE SINCE END OF LAST SYMBOL INDICATES "0"

FIG. 7

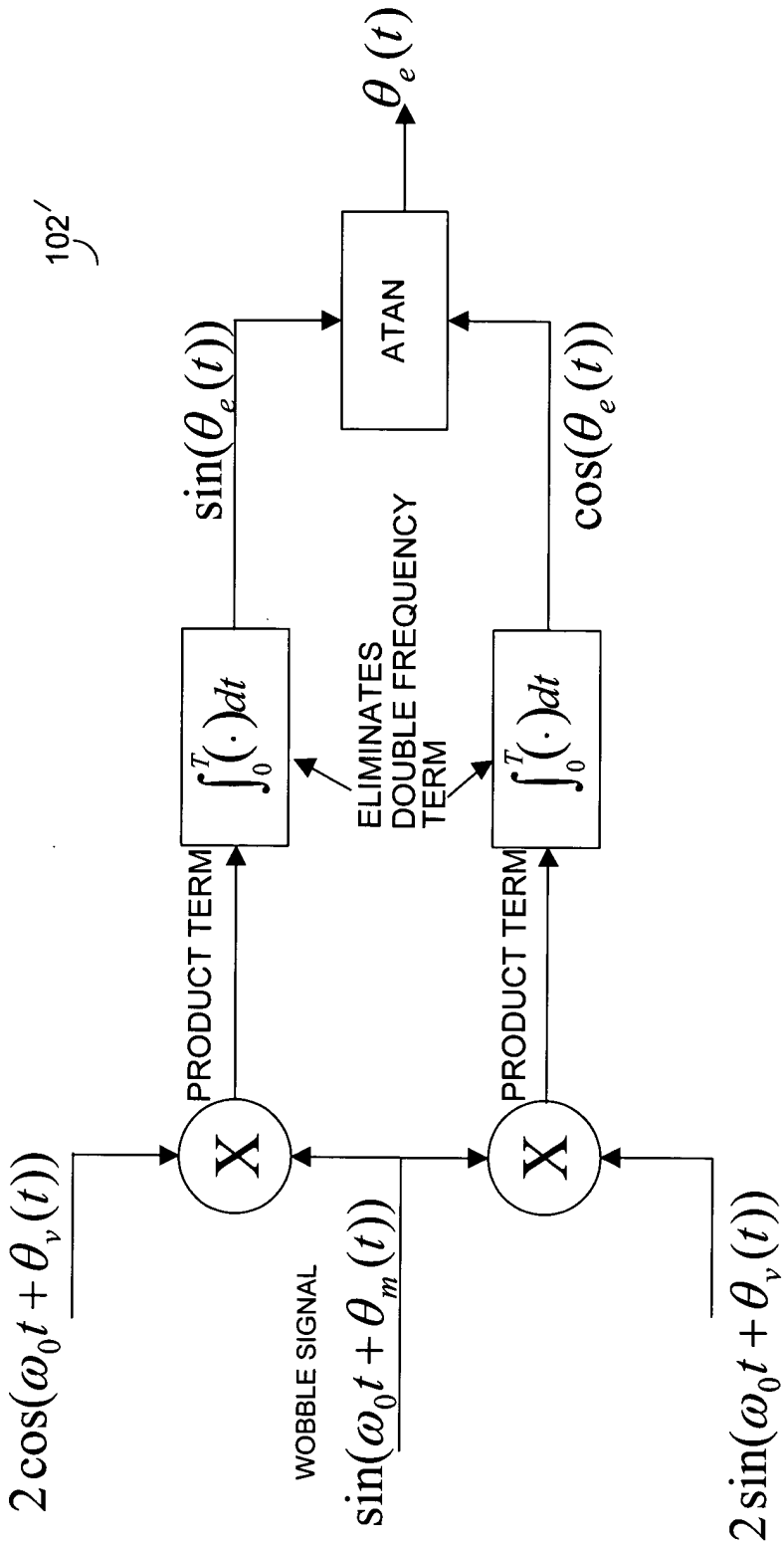
102'
$2\cos(\omega_0 t + \theta_v(t))$
$\sin(\omega_0 t + \theta_m(t))$
WOBBLE SIGNAL
$2\sin(\omega_0 t + \theta_v(t))$
X
X
PRODUCT TERM
PRODUCT TERM
$\int_0^T(\cdot)dt$
$\int_0^T(\cdot)dt$
ELIMINATES DOUBLE FREQUENCY TERM
$\sin(\theta_e(t))$
$\cos(\theta_e(t))$
ATAN
$\theta_e(t)$

FIG. 8

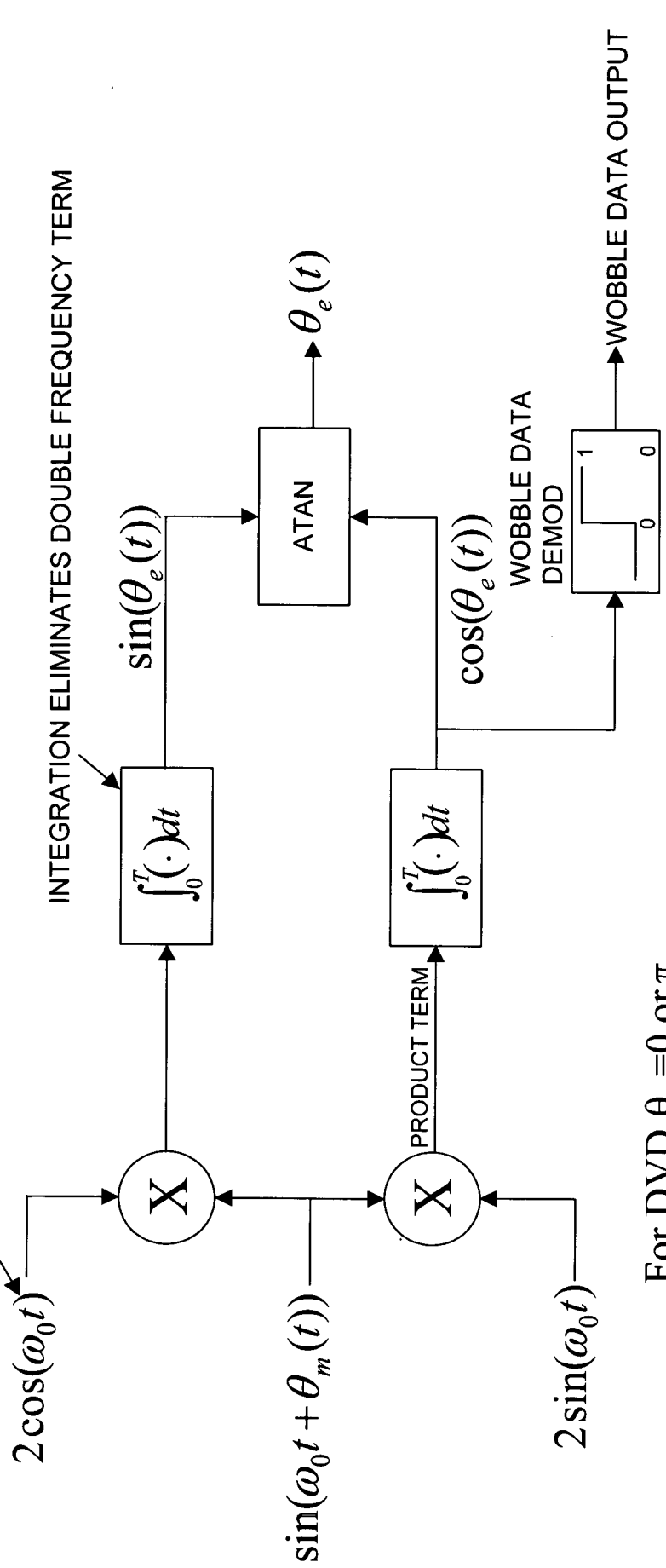
102'
NO VCO ERROR WHEN LOCKED
INTEGRATION ELIMINATES DOUBLE FREQUENCY TERM
$2\cos(\omega_0 t)$
$\sin(\omega_0 t + \theta_m(t))$
$2\sin(\omega_0 t)$
X
X
$\int_0^T(\cdot)dt$
$\int_0^T(\cdot)dt$
PRODUCT TERM
$\sin(\theta_e(t))$
$\cos(\theta_e(t))$
ATAN
$\theta_e(t)$
WOBBLE DATA DEMOD
1
0
0
WOBBLE DATA OUTPUT
For DVD, θ_m=0 or π,
so θ_e= 0 or π,
so $\cos(\theta_e)$=1 or -1

FIG. 9

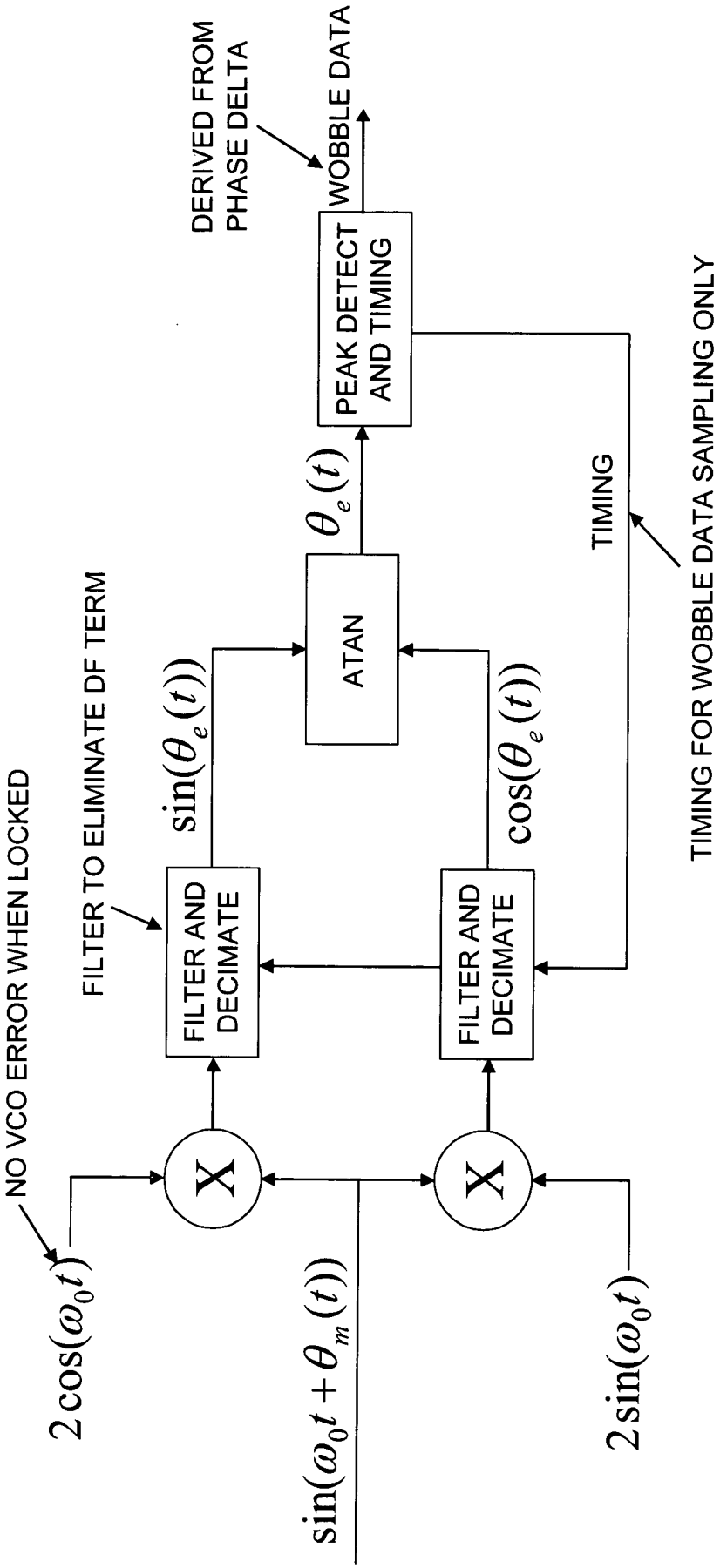
NO VCO ERROR WHEN LOCKED
$2\cos(\omega_0 t)$
$\sin(\omega_0 t + \theta_m(t))$
X
X
FILTER TO ELIMINATE DF TERM
FILTER AND DECIMATE
FILTER AND DECIMATE
$\sin(\theta_e(t))$
$\cos(\theta_e(t))$
ATAN
$\theta_e(t)$
PEAK DETECT AND TIMING
DERIVED FROM PHASE DELTA
WOBBLE DATA
TIMING
TIMING FOR WOBBLE DATA SAMPLING ONLY
$2\sin(\omega_0 t)$

FIG. 10

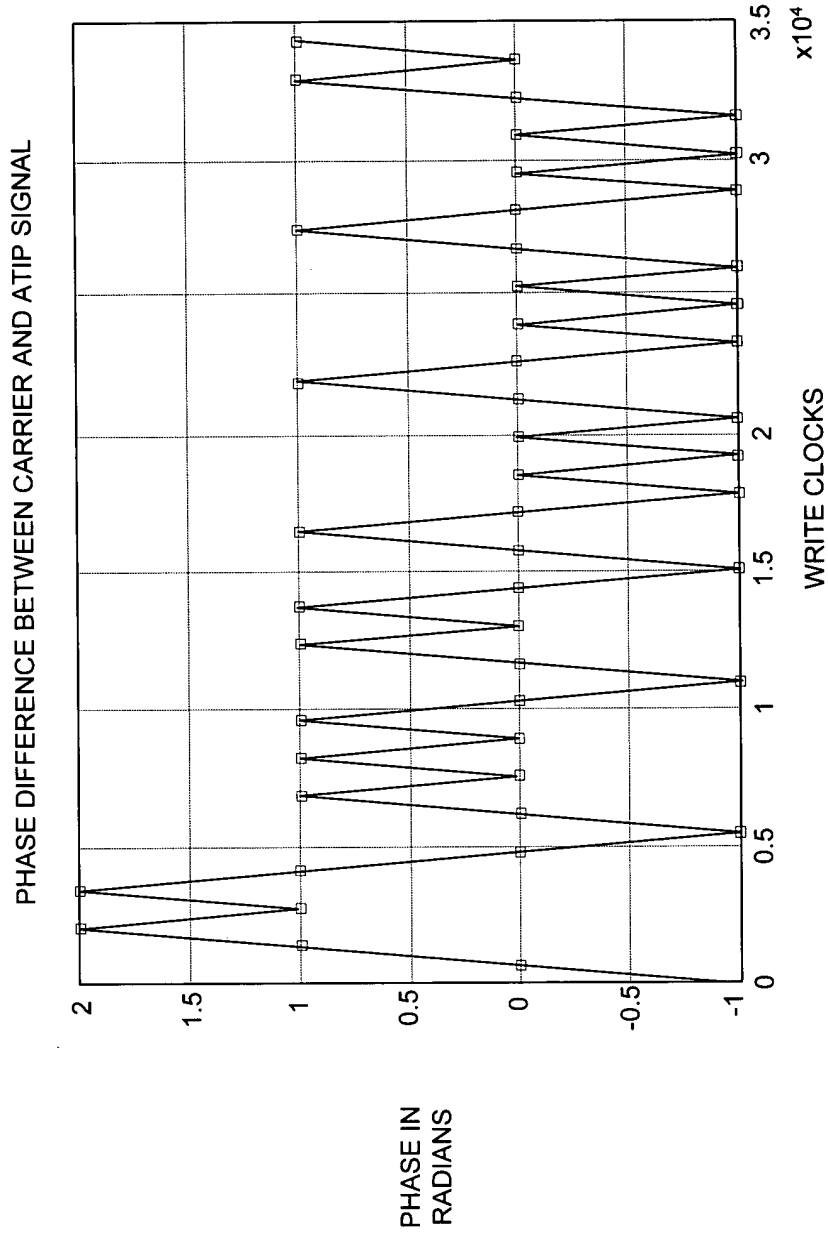
PHASE DIFFERENCE BETWEEN CARRIER AND ATIP SIGNAL
PHASE IN RADIANS
2
1.5
1
0.5
0
-0.5
-1
0
0.5
1
1.5
2
3
3.5
x10^4
WRITE CLOCKS

FIG. 11